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September 3, 2013
File Nos. 43S0051 & 43S0188 (RWP)

Hewlett Packard Company
ATTN: Mr. Paul Paschke
1501 Page Mill Road
Palo Alto, CA 94304

paul_paschke@hp.com

Varian Medical Systems
ATTN: Mr. Alan Palter
3100 Hansen Way
Palo Alto, CA 94304

alan.palter@varian.com

SUBJECT: Modification of Vapor Intrusion Evaluation Workplan Approval for 640 Page Mill Road and 601 California Avenue, Palo Alto, Santa Clara County, CA

Dear Mr. Paschke and Mr. Palter:

This letter modifies the following letters from the San Francisco Bay Regional Water Quality Control Board (Regional Water Board) to Hewlett Packard Company (HP) and Varian Medical Systems (Varian).

- March 12, 2012 Regional Water Board letter conditionally approving HP and Varian's February 17, 2012, Revised Work Plan for Indoor Air Testing - COE Study Area (Workplan; March 2012 Letter)
- December 4, 2012 Regional Water Board letter that responded to HP and Varian's May 24, 2012 letter requiring HP and Varian to use the California Health and Hazard Screening Levels (CHSSLs) to evaluate potential indoor air vapor intrusion (December 2012 Letter)

In recent discussions between the Regional Water Board, United States Environmental Protection Agency (EPA) Region 9, and HP and Varian, a request was made to the Agencies for clarification of the contaminant action levels and commercial building indoor air sampling approach applicable to the project. This letter clarifies the Agencies' position on these issues and provides additional background information.

The Regional Water Board, in conjunction with EPA Region 9, are hereby requiring that the following three items, related to trichloroethylene (TCE) and tetrachloroethylene or perchloroethylene (PCE) response action levels and commercial indoor air sampling, be addressed by submitting to the Regional Water Board a revised version of the February 17, 2012 Workplan within thirty (30) calendar days of receipt of this letter.

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Item #1 – Interim TCE Indoor Air Short-term Response Action Levels and Guidelines

Background: In September 2011, EPA published its *Toxicological Review of Trichloroethylene in Support of the Integrated Risk Information System (IRIS)*. Recent findings on TCE conclude that women in the first trimester of pregnancy are one of the most sensitive populations to TCE short-term inhalation exposure.

EPA uses a level of concern for non-cancer effects as a ratio of the exposure concentration to a reference concentration (RfC). This ratio is defined as a Hazard Quotient and abbreviated "HQ". The IRIS assessment derived an inhalation RfC for chronic inhalation exposure to TCE, which is 2 micrograms per cubic meter (2 $\mu g/m^3$).

Note that the inhalation exposure need not be a chronic exposure to apply the RfC. Because this is a developmental effect, the critical period for exposure is considered to be within an approximate 3-week period in the first trimester of pregnancy during which the heart develops. Scientific information on the exact critical period of exposure for this health impact is not currently available; however, general risk assessment guidelines for developmental effects indicate that exposures over a period as limited as 24 hours[1] may be of concern for some developmental toxicants.

EPA Region 9 is using health protective response action levels and guidelines to address short-term inhalation exposures to TCE in indoor air from the subsurface vapor intrusion pathway. The purpose of these interim response action levels and guidelines is to be protective of one of the most sensitive and vulnerable populations, women in their first trimester of pregnancy, because of the potential for cardiac malformations to the developing fetus during this short timeframe. This approach is consistent with recommendations provided by Region 10[2] and with previous actions taken at Region 9 Superfund sites where TCE is a potential vapor intrusion contaminant of concern.

These guidelines identify women of reproductive age as the sensitive population of concern, rather than only pregnant women, because some women may not be aware of their pregnancy during the first trimester.

Modification Required: The Workplan shall be revised to incorporate the following interim short-term response action levels for TCE and response timeframes for the vapor intrusion investigation.

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1 U.S. EPA. Guidelines for Developmental Toxicity Risk Assessment. U.S. Environmental Protection Agency, Risk Assessment Forum, Washington, DC, EPA/600/FR-91/001, 1991.

2 Memo: "OEA Recommendations Regarding Trichloroethylene Toxicity in Human Health risk Assessments." JC Kelly, Office of Environmental Assessment, U.S. EPA Region 10, Dec 13 2012.

Interim TCE Indoor Air Short-term Response Action Levels Residential and Commercial TCE Inhalation Exposure from Vapor Intrusion Hewlett-Packard 620-640 Page Mill Road Superfund Site Palo Alto, CA		
Exposure Scenario	***Prompt Response Action Level*** *(HQ=1)*	***Immediate Response Action Level*** *(HQ=3)*[3]
Residential *	2 µg/m3	6 µg/m^3
Commercial/Industrial ** (8-hour workday)	8 µg/m^3	24 µg/m^3
(10-hour workday)	7 µg/m^3	21 µg/m^3

* The residential HQ=1 prompt response action level is equivalent to the inhalation reference concentration (RfC) since exposure is assumed to occur continuously over a 24-hour period.
** Commercial/Industrial prompt response action levels are calculated as the 24-hour time-weighted average from the RfC, based on the length of a workday (e.g., for an 8-hour workday: Prompt Response Action Level = (168 hours per week/40 hours per week) x 2 µg/m^3 = 8 µg/m^3). Time-weighted adjustments can be made as needed for workplaces with longer work schedules.
Note: These prompt response action levels are near the lower end of the Superfund target cancer risk range; thus, the health protective risk range for both short-term and long-term exposures becomes truncated to: 0.4 – 2 µg/m^3 for residential exposures and 3 – 8 µg/m^3 for 8-hour/day commercial/industrial exposures.

Assessment of TCE Inhalation Vapor Intrusion Exposure in Residential and Commercial/Industrial Buildings and Prompt and Immediate Response Actions

The following tiered response actions shall be included in the Revised Workplan for assessing and responding to inhalation exposures to TCE in residential and commercial settings caused by subsurface vapor intrusion at the Site.

Interim Short-term Response Action Levels and Tiered Responses:

- **TCE Indoor Air Concentration > Prompt Response Action Level (HQ=1) and below the Immediate Response Action Level (HQ=3)**: In the event the indoor air TCE concentration is detected above the prompt response action levels, then interim mitigation measures should be evaluated and implemented quickly, and their effectiveness (defined as a reduction of the TCE indoor air concentration to below HQ=1 level) confirmed promptly (e.g., all actions completed and confirmed within a few weeks).

- **TCE Indoor Air Concentration ≥ the Immediate Response Action Level (HQ=3)**: In the event the indoor air TCE concentration is observed to be greater than or equal to the immediate response action level, interim mitigation measures should be implemented immediately and their effectiveness (defined as a reduction of the indoor air TCE concentration to below HQ=1 level) confirmed before any additional exposure is allowed to occur (e.g., all actions completed and confirmed within a few days).

[3] There is a need to identify those TCE exposures that exceed the RfC by a magnitude sufficient enough that a more urgent response is prudent; it is EPA Region 9 practice to take immediate action to address exposures at or above an HQ=3 level.

Implementation of Interim Mitigation Measures to Mitigate TCE Short-term Exposure:

The following interim response actions (mitigation measures) should be considered along with how quickly they can be implemented to reduce exposure to below the TCE short-term response action levels:

- Increasing building pressurization and/or ventilation mechanically with fans or the building ventilation system by increasing outdoor air intake
- Installing and operating engineered, sub-floor exposure controls (sub-slab and/or crawlspace depressurization; or in some cases a soil vapor extraction system)
- Eliminating exposure by temporary relocation, which may be indicated when "immediate" response actions are warranted.

The following interim measures may also be considered, but may have limited effectiveness and require additional monitoring to verify their effectiveness:

- Sealing and/or ventilating potential conduits where vapors may be entering building
- Treating indoor air (carbon filtration, air purifiers)

Item #2 – On-property commercial buildings

Background: The Regional Water Board's March 2012 Letter required HP and Varian to evaluate potential indoor air vapor intrusion in the off-property residential and commercial buildings in the Study Area, as defined by the area *respectively* bounded by groundwater-TCE isoconcentration contours of 50 and 100 micrograms per liter (µg/L).

HP and Varian subsequently completed testing of 20 residential buildings, 1 mixed-use residential/commercial building, and 1 commercial building (with building ventilation [HVAC] systems operating, see below Item #3). Eight commercial buildings have not yet been sampled in the off-property Study Area.

Modification Required: In addition to indoor air sampling at the commercial buildings in the off-property area, the two on-property commercial buildings at the source properties (650 Page Mill Road and 601 California Avenue) must also be evaluated for potential indoor air vapor intrusion, using the same evaluation criteria that are specified in the December 2012 Letter. Note that regarding PCE, for sites within California, the indoor air sampling results should be evaluated using the California-modified screening levels, specifically, 0.4 – 40 $\mu g/m^3$ for residential exposures and 2-180 $\mu g/m^3$ for commercial/industrial exposures (defining the low end/10^{-6} and high end/10^{-4} of the cancer health protective risk range).

Item #3 – Building Ventilation System (HVAC)-off sampling

Background: The Agencies appreciate HP and Varian's vapor intrusion evaluation work during normal working hours with the building heating, ventilation, and air conditioning (HVAC) systems operating, and HP and Varian's cooperation with the March 2012 Letter that required HP and Varian to conduct the vapor intrusion evaluation with the HVAC systems off in the off-property area.

As discussed on May 1, 2013, in addition to sampling commercial buildings under current building operating conditions, it is also necessary to conduct indoor air sampling with the building ventilation systems turned off to evaluate the potential for subsurface vapor intrusion into the building without reliance on the indoor air ventilation system and to develop an understanding of possible exposure scenarios.

Modification Required/Clarification: An additional round of sampling is required in commercial buildings with the building ventilation systems turned off. Sampling events should begin a minimum of 36 hours following shut down of the HVAC systems and proceed while HVAC systems are off.

This requirement for submittal of a revised Workplan within thirty (30) calendar days of receipt of this letter is made pursuant to Water Code Section 13267, which allows the Regional Water Board to require technical or monitoring program reports from any person who has discharged, discharges, proposes to discharge, or is suspected of discharging waste that could affect water quality. The attachment provides additional information about Section 13267 requirements. Any extension in the above deadline must be confirmed in writing by Regional Water Board staff.

If you have any questions, please contact Roger Papler of my staff at (510) 622-2435 [e-mail rpapler@waterboards.ca.gov].

Sincerely,

Bruce H. Wolfe
Executive Officer

Attachment: 13267 Fact Sheet
cc w/Attachment: Mailing List

MAILING LIST

EPA Region 9
ATTN: Ms. Melanie Morash
75 Hawthone Street
San Francisco, CA 94105
morash.melanie@epa.gov

EPA Region 0
ATTN: Ms. Vickie Rosen
75 Hawthone Street
San Francisco, CA 94105
rosen.vicki@epa.gov

Santa Clara Valley Water District
ATTN: Mr. George Cook
5150 Almaden Expressway
San Jose, CA 95118
gcook@valleywater.org

City of Palo Alto Fire Department
ATTN: Mr. Gordon Simpkinson
250 Hamilton Avenue
Palo Alto, CA 94301
gordon.simpkinson@cityofpaloalto.org

Stantec Consulting, Inc.
ATTN: Mr. Chris Maxwell
57 Lafayette Circle, 2nd Floor
Lafayette, CA 94549
chris.maxwell@stantec.com

Stantec Consulting, Inc.
ATTN: Mr. Mark Becker
15575 Los Gatos Boulevard Building C
Los Gatos CA 95032
mark.becker@stantec.com

Stanford Management Company
ATTN: Ms. Annette Walton
2777 Sand Hill Road
Menlo Park, CA 94303
nettie@stanford.edu

STEPHEN: PLEASE INSERT NEW 13267 FACT SHEET